2 April 2014 - A new long-range forecast system developed by Met Office scientists has delivered a potential advance in the skill of predictions for European and North American winters.

The system uses a next generation prediction system to give potentially more helpful guidance on winter weather patterns up to weeks ahead.

Key to the development is the ability to more skilfully predict the North Atlantic Oscillation (NAO), which describes differences in air pressure over the ocean between Iceland and the Azores, and it is a basic measure of the strength of the jet stream.

The NAO is an important factor in determining the difference between cold and dry winters, and mild wet and stormy winters. It largely governs wind strength, number of storms, the number of extremely cold days, and winter rainfall patterns.

More skilful predictions of the NAO open the door to better risk based forecasts and potential impacts for example on energy supply, transport infrastructure, flooding, and storm damage.

Professor Adam Scaife, Head of Monthly to Decadal Prediction at the Met Office, said: "This is not a silver bullet for providing forecasts of weather on individual days months ahead, but it is a big step forward in our efforts to better predict the risk of disruptive winter weather weeks ahead.

"As with any long-range forecast, even the new system can only deliver forecasts of the risk of different types of winter conditions. Seasonal forecasting remains a science challenge and we will still see occasions where winter weather does not match the most likely forecast scenario. Nevertheless this is a major step forward and underlines our confidence that further research can deliver even greater benefits."

The forecast system is based on the highest resolution climate model in operation in the world, which is the result of years of development by Met Office scientists.

It has unprecedented ocean resolution for an operational long range forecast system, with gridboxes of a quarter of a degree of latitude and longitude (25km) over the whole globe. Similarly the atmospheric resolution has been improved to gridboxes of less than 1 degree (50km).

The model also includes a representation of sea ice and stratospheric processes which interact with the ocean and the rest of the atmosphere as the forecast progresses.

Testing of the system has been carried out by looking at 20 past winters, including the extreme winters of 2009/10 and 2010/11, as well as the mild stormy winter of 2011/12.

For each winter, the forecast system was run from early November through to the following March using only observations that would have been available at the time.

A total of 24 different forecasts (known as an ensemble) are produced for each winter, and then an assessment of the risks of certain types of winter weather can be made.

Dr Alberto Arribas, who helped develop the forecasting system, said: "The multiple forecasts for each winter allow us to extract the forecast signal from within the chaotic variability of the climate system. The more times we run the forecast model, the more skilful the prediction. The forecasts are very computer intensive and this currently limits forecast accuracy. In time, we hope to be able to improve accuracy further as technology advances and we continue to develop this vital area of science."

Details of the new forecast system and its accuracy appear in a research paper published in the journal Geophysical Research Letters .

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